1898MNRAS..58R.143.

studies at the Middlesex Hospital. He was a member of the original Council of the Royal Botanic Society of London, and took an active part in planning the gardens and in promoting the interests of that Society. In 1846 he was elected a Member of the Royal Institution of Great Britain, and formed a close friendship with the late Professor Faraday. He was for some years Physician to the Western General Dispensary, and was in 1857 admitted a Fellow of the Royal College of Physicians, London.

In consequence of a severe illness he retired from the active practice of his profession, and removed to Edinburgh in 1859. After residing there and at several places in England, he came to Ipswich in 1886, where he died on 1897 April 7.

During the last twenty years of his life he took special interest in Solar Physics. He was elected a Fellow of the Society on 1853 June 10.

Charles Stewart was born at Bo'ness, Linlithgowshire, in 1818, and died at his residence, Ackender House, Alton, Hants, 1897 September 6. For many years Dr. Stewart had a private school, from which he retired in 1889. He was elected a Fellow of the Society 1865 November 10, and was specially interested in meteors and nebulæ.

Edward James Stone was born in London on 1831 February 28. He was the elder son of Mr. Edward Stone, a member of a Devonshire family, who carried on a successful business in London. Young Stone was educated privately, but, for the benefit of his health, a large portion of his early youth was spent among his relatives in the country. His preparatory education was therefore much interrupted, his parents preferring that he should enjoy for a time the freedom of a country life, in order that his strength might be sufficiently established to enable him eventually to assist his father in his business. During these early years, young Stone, who was extremely partial to his Devonshire home, showed no indications of the innate talent he undoubtedly possessed. On his return to London, however, as his age advanced, a love of private reading was noticed, though his opportunities were very limited, for he had passed his twentieth year before he was induced to begin the study of classics or mathematics. Soon after this he was persuaded by his friends to become a student at King's College, London, and he considered that this new departure was the turning-point in his life. He has often remarked that he owed his successful career at Cambridge to the careful training he received there, especially to the Rev. T. G. Hall, who was the first to discover his latent mathematical power, and to the Rev. Dr. Major, who assisted him privately with his classics, etc.

At King's College Stone soon gave evidence of the mathematical talent that up to this time had remained dormant. He was very enthusiastic, and his progress both in classics and

1898MNRAS..58R.143.

mathematics was rapid. In his twenty-fourth year he entered Queens' College, Cambridge, and in 1856 he gained a scholarship. His abilities were at once recognised, and it was soon predicted by his tutors that he would take a high place in the mathematical tripos. He was, however, handicapped by occasional attacks of nervous prostration, one of which was so serious that he was unable to attend the tripos examination in 1858, thus deferring his degree for a year. In 1859 January, he graduated B.A. as Fifth Wrangler, and shortly afterwards he was elected a Fellow of Queens' College. Considering the comparatively little educational training he had had in his youth; that his higher education was not commenced until he had passed his twentieth year; that he went up to Cambridge much later in life than most freshmen; and that his health at college was never robust, his scholarship in 1856 and his high degree in mathematical honours in 1859, are somewhat remarkable examples of academic success.

It was the intention of Mr. Stone to remain at Cambridge as a resident Fellow of his college, devoting himself to the care of pupils; but on the appointment, in 1860, of the Rev. Robert Main, Chief Assistant at the Royal Observatory, to the post of Radcliffe Observer at Oxford, some of his Cambridge friends, knowing that he had shown an interest in astronomical questions, recommended him to the Astronomer Royal as a suitable person to fill the vacancy at the Observatory. His official appointment as Chief Assistant was confirmed by warrant of the Board of Admiralty on 1860 October 1. Airy, in his next annual report to the Board of Visitors, wrote :—" I have every reason to believe that Mr. Stone will well support the scientific honour of the Observatory, and its reputation for order and accuracy in the conduct of business. As First Assistant, Mr. Stone is intrusted with the fullest confidence from me, and the fullest superintendence of the Observatory in general."

When Mr. Stone first entered upon his official duties at the Royal Observatory, he was not much acquainted with the ordinary practical work required at Greenwich, but, with the help of the senior astronomical assistants, it was not long before his own personal interest in the meridian and equatorial observations became apparent, but he was only occasionally called upon to observe with any of the instruments, or to assist in the ordinary reductions of the observations. He was thus enabled to master easily the general routine business, and to undertake several original investigations, usually based on the Greenwich published results. These were not strictly official, but sometimes the subject was a special suggestion of the Astronomer Royal.

During the ten years that Mr. Stone remained at Greenwich, one of the principal astronomical questions under discussion was the importance of obtaining a new determination of the value of the constant of the Sun's horizontal mean equatorial parallax. Both Hansen and Le Verrier had found that to reconcile the observed places of the Moon and planets with the corresponding

1898MNRAS..58R.143.

theoretical places, it was necessary to make a considerable increase in the mean adopted value, as determined by Encke from the observations of the transit of *Venus* in 1769. Airy, who always took much interest in this problem, gave, in 1857, an oral statement at the April meeting of the Society, suggesting a redetermination of the value of this constant indirectly from comparisons of *Mars* and neighbouring stars at the oppositions of 1860 and 1862, both being particularly favourable for the purpose. Consequently, several successful series of comparisons were obtained at the principal observatories in both hemispheres. At Airy's request, Mr. Stone undertook the discussion of the observations made at Greenwich, the Cape of Good Hope, and Williamstown, near Melbourne. He entered upon this investigation with great enthusiasm, having little or no desire for extraneous help, although Airy offered any computing assistance that he might require. The resulting value was 8″·94, differing very little from the values indicated by Hansen and Le Verrier from theory, and from Winnecke's result determined from a different combination of observations of *Mars* and stars. This agreement gave Mr. Stone at the time a great confidence in the accuracy of his own calculations, and he firmly believed that his new value must be very near the true one.

A more important memoir on the same subject—"A Rediscussion of the Observations of the Transit of *Venus*, 1769"—was communicated to the Society in the autumn of 1868, and published in the *Monthly Notices*, vol. xxviii. For this paper the Council in the following January awarded the Gold Medal to Mr. Stone. It occurred to him that a new discussion of the observations of this transit might lead him to the discovery of some sources of systematic error or wrong interpretation affecting Encke's value. He was intensely interested in his own interpretations of the various phenomena of apparent and real internal contact, as inferred from the notes of the different observers, and he implicitly believed that his interpretations were correct, and that they led to a solution giving a satisfactory indication of an interval of nineteen seconds of time between the internal contact and the breaking of the black drop. His conclusions, however, were not altogether free from criticism, though he had his usual confidence in the resulting value 8″·91. He considered that this value was entitled to great weight, and was in most satisfactory agreement with those that had lately been otherwise obtained—an opinion evidently shared by the President, Admiral R. H. Manners, who, on presenting the Gold Medal to Mr. Stone, remarked that "by this important investigation Mr. Stone has earned for himself the gratitude of astronomers of all countries. He has shown beyond all doubt that the method pursued by his illustrious countryman, Halley, when fairly treated, is capable of furnishing a value of the solar parallax commensurate in precision with the expectations formed of it. But this is not all. Mr Stone, by his researches in this instance, has wiped from astro-

1898MNRAS..58R.143.

nomy a reproach, which did not, indeed, legitimately attach to it, but which only one of those intellectual triumphs which from time to time have adorned the annals of our science was capable of extirpating."

A reference to the *Monthly Notices* and *Memoirs* of the Society shows at once that Mr. Stone was indeed a hard worker all the time he was at Greenwich. Sometimes he had more than one investigation in hand at the same time, in addition to the daily official correspondence and other routine matters that usually devolved upon him. Some of these researches were of great importance, the results of considerable calculation, while most of the final preparation of his memoirs was performed in his leisure hours at home. His principal memoirs about this time—"On the Proper Motions of the Stars in the Greenwich Seven-Year Catalogue," "On the Sun's Mean Equatorial Horizontal Parallax from Observations of *Mars* and Stars," "On the Accuracy of the Fundamental Right Ascensions of the Greenwich Seven-Year Catalogue," "On the Constant of the Lunar Parallax," and "On the Constant of Nutation"—are all of some length, and printed in the *Memoirs*. His contributions to the *Monthly Notices* were very numerous during these ten years on almost every branch of current astronomy, including a valuable paper on "Bessel's Mean Refractions." In addition to all this work, Mr. Stone, as Honorary Secretary, took a very prominent part in the business of the Society from 1866 to 1870, and in the preparation of the annual reports of the Council for these years.

In the spring of 1870 Sir Thomas Maclear, Her Majesty's Astronomer at the Cape Observatory, resigned his office, leaving a large mass of valuable meridian observations unreduced. Mr. Stone, who was beginning to be anxious for a more independent position, became the successful candidate for the vacant post. He received official notice of his appointment early in June. He landed at Cape Town in the following October, and soon afterwards took up his residence at the Observatory. His promotion was considered a very appropriate one, though it was certainly a heavy task laid upon the new director to reduce the accumulated mass of arrears of his predecessor, and "to render these results available for the use of astronomers with as little delay as possible," as well as to continue the ordinary current work of the Observatory. Such were his official instructions on leaving England! How successfully he performed this task is now a matter of astronomical history.

The principal object Mr. Stone had in view on accepting the position of Her Majesty's Astronomer at the Cape was the formation of a standard catalogue of southern stars to about the seventh magnitude from observations made with the Cape transit-circle. He hoped to be able to publish a catalogue in which the star places would favourably compare in accuracy with those given in the Greenwich catalogues. He expected to take ten

1898MNRAS..58R.143.

years for the completion of this scheme. It should be remembered that Mr. Stone never had much clerical assistance during the whole time he was at the Cape, and therefore for all purposes he had to rely upon the ready co-operation of his few established assistants. Those who have had anything to do with the compilation of a standard star catalogue can understand that the preparation of the Cape Catalogue of more than 12,400 stars must have been an immense labour with so small a staff. Mr. Stone apparently worked continuously on it, occasionally assisted by Mrs. Stone, while he also took a share of the observations. He remarks in the preface to the Catalogue:—"Besides the general organisation and arrangement of the work, and the making in each year sufficient observations to check the instrumental adjustments, and the general working of the transit-circle, I have made it a rule to throw my personal weight upon any part of the work which, from time to time, appeared to flag. I have thus taken a direct share in the work to an extent which appears somewhat unusual on the part of the director of large observatories, but this was inevitable."

The reductions of this standard catalogue of 12,441 southern stars were completed, and a portion of the catalogue formed, before Mr. Stone left the Cape on 1879 May 13, but there was still a considerable amount of revision and examination requiring his attention. This, and the superintendence of the printing of the volume, occupied much of his time after his return to England. The catalogue was published in 1881, for which, in the same year, the French Académie des Sciences awarded him the Lalande astronomical prize. Soon after he commenced his residence at the Cape Observatory Mr. Stone, according to his official instructions, directed his thoughts towards completing the reductions of the meridian observations made under the direction of Sir Thomas Maclear during the years 1856 to 1860. The volume of results for 1856 was published in 1871, for 1857 and 1858 in 1872, and those for 1859 and 1860 in 1874. The general catalogue of 1159 stars derived from all these observations, reduced to the epoch 1860, was published in 1873. A second general catalogue of 2892 stars for the epoch 1840, based on Maclear's meridian observations made between 1834 and 1840, was published in 1878.

Mr. Stone was fortunate in being able to observe the total eclipse of the Sun on 1874 April 16. As the central line of shadow passed through a region not easily accessible to European astronomers, he, as their representative in South Africa, was very anxious that the eclipse should not pass away unrecorded. Accompanied by Mrs. Stone, who assisted him in the observations, he selected a station at Klipfontein, in Namaqualand. Although his instrumental equipment was limited to a 4-inch telescope, mounted as an altazimuth, and a small spectroscope, he succeeded in observing the reversal of the Fraunhofer lines at the disappearance of the Sun's limb, and in making many other important observations of the structure and composition of the

1898MNRAS..58R.143.

corona. The details of this expedition are given in vol. xlii. of the *Memoirs.* While in Namaqualand Mr. Stone also made a series of magnetical observations at four stations, the first made in that region of South Africa. He took no part in the many eclipse expeditions organised in England since his return from the Cape; but, at the invitation of Sir George Baden-Powell, he joined a private party on board the yacht *Otaria*, who were proceeding to Novaya Zemlya to witness the total eclipse of the Sun on 1896 August 9. The sky was fortunately clear during the totality, and Mr. Stone was one of the few astronomers who made any successful observations of this eclipse. The results were communicated to the Society in the following December, and will be published in the next volume of the *Memoirs.*

Although Mr. Stone's occupations at the Cape were absorbing, he yet found time to prepare several important memoirs, some on astronomical subjects, and others on some point in physical science. The volumes of the *Monthly Notices* give sufficient evidence of this. He also communicated to the Royal Society several papers, including results of experiments made at Greenwich on the heating power of stars; an experimental determination of the velocity of sound; magnetical observations made in Namaqualand; and on a cause for the appearance of bright lines in the spectra of irresolvable star clusters. The transit of *Venus* in 1874 was favourably observed at egress by Mr. Stone and his assistants at the Cape Observatory.

After the publication in 1877 of the official report on the observations of the transit of *Venus* in 1874, drawn up under the supervision of Sir George Airy, from which a mean solar parallax of $8''\cdot76$ was deduced, Mr. Stone made a rediscussion of the various observations of contact, in accordance with his own particular views on the subject. He obtained a mean parallax of $8''\cdot89$ from his interpretation of the contact observations, and he states that his result absolutely negatived any value smaller than $8''\cdot84$, or larger than $8''\cdot93$.

The Rev. R. Main, Radcliffe Observer, died in the spring of 1878, and towards the end of the year Mr. Stone was appointed by the Radcliffe Trustees to succeed him. He, however, was not able to take up his residence at Oxford before the end of 1879 June, but Professor Pritchard had the general charge of the Observatory in the meantime. Mr. Stone was very gratified at this appointment, especially as it enabled him to renew his association with former astronomical friends, and with the proceedings of the Society.

Mr. Stone was a member of the Transit of *Venus* Committee appointed by the Royal Society to advise upon the conduct of the observations to be made in the transit of 1882, and also of the Executive Committee, on which he acted as the directing astronomer of the arrangements. He was intrusted with the general superintendence of the preliminary training of the observers at the Radcliffe Observatory, and of the instrumental equipment of

1898MNRAS..58R.143.

the different stations. After the transit he undertook, with the assistance of a special computer, all the reductions, and also the discussion of all the observations of the various phases of external and internal contact. The interpretation of the true meaning of the notes of the observers entailed a considerable personal labour on Mr. Stone; but eventually he determined the value of mean solar parallax from this transit to be 8″·832. The final report of the Government Committee was drawn up by Mr. Stone, and published in 1887 by order of the House of Commons.

While at Oxford Mr. Stone usually controlled the daily work of the Observatory, devoting much personal attention to the supervision of the reductions, but he took no active share in the ordinary observations. In the autumn of 1888, however, he made a special series of heliometer observations of the minor planet *Iris* with comparison stars, in accordance with a scheme of combined operations proposed by Dr. Gill, for a new determination of the value of the constant of solar parallax. He entered upon this duty with great energy, although the watches were long and wearying, extending generally to about 2 A.M. He took much interest in these observations, hoping to make the series as complete as possible; but though he obtained several sets of comparisons, the Oxford variable climate prevented him from making it as perfect as he had wished. In the following year Mr. Stone also made several attempts to observe the minor planets *Victoria* and *Sappho*, for the same purpose; but owing to the faintness of the planets and broken weather, no satisfactory observations were made.

The Radcliffe Catalogue of 6424 stars for the epoch 1890, published in 1894, is a valuable work, and a most important contribution to sidereal astronomy. This catalogue contains the positions of all the stars to the seventh magnitude, from the equator to 115° N.P.D., excepting those in clusters, observed with the transit-circle during the years 1880 to 1893. The positions of some fainter stars to fill existing lacunæ, and of a few others observed beyond the adopted limits for some special purpose, are also included in the catalogue. This important work may be considered as the continuation and completion of the original plan of operations commenced at the Cape Observatory in 1870, and there can be no doubt that upon Mr. Stone's two noble standard star catalogues his reputation as a practical astronomer will principally rest.

The Royal Society "Catalogue of Scientific Papers" to 1883 contains the titles of ninety-two separate papers by Mr. Stone. About sixty more were communicated by him to the Royal Astronomical Society between 1884 and 1897. Many of these are of great interest, but the limited space at our disposal forbids any special reference to them here. The titles may be easily found in the various indexes to the *Monthly Notices.* The long series of controversial papers on a supposed change in the adopted length of the mean solar day ought not, however, to be passed over without some brief

1898MNRAS..58R.143.

notice, as this was a question that largely occupied his attention during the last fourteen years of his life. On 1883 May 11, he communicated to the Society a paper stating that he had discovered the principal cause of the large errors existing between the positions of the Moon deduced from Hansen's Lunar Tables and observation. He attributed these increasing tabular errors to a change in the unit of time, caused by the adoption in 1864 of Le Verrier's expression for the sidereal time at mean noon instead of that of Bessel, which had been previously in use in the calculations of the *Nautical Almanac*. Mr. Stone contended that in consequence of this change of formulæ in the *Nautical Almanac* calculations of the sidereal time at Greenwich mean noon, the unit of mean solar time was practically altered to such an extent that at the end of 1881 the difference amounted to nearly twenty-seven seconds, increasing at the rate of about $1^{s}\cdot46$ per annum. This explanation was given by Mr. Stone with much confidence in its accuracy, but Professors Adams and Cayley at once pointed out in the clearest and simplest manner that this view of Mr. Stone was erroneous, and that the true rate of increase per annum was only 1-365th part of that amount, or $0^{s}\cdot004$. However, notwithstanding the expressed opinions of these and several other leading mathematical astronomers, it is remarkable that he sincerely and firmly believed that his theory was correct, and that the substitution in 1864 of Le Verrier's Solar Tables for those of Carlini fully accounted for the increasing errors of Hansen's Lunar Tables, even after his attention had been specially drawn to the point where his reasoning was shown to fail. So strong was he in this belief, that he was never able to perceive, or to acknowledge in any way, that his arguments could possibly be unsound, though it had been practically proved by calculation that whether Le Verrier's or Carlini's Tables were used to compute the sidereal times at mean noon, the tabular errors of Hansen's Tables would be substantially the same. On the contrary, he continued year after year to carry on the controversy with excellent temper, defending his conclusions with great earnestness and pertinacity, due in some measure to his naturally sensitive disposition.

Mr. Stone was elected a Fellow of the Society on 1861 January 11. He at once took an active share in the discussions at the meetings. He was a member of the Council from 1863 to 1870, and again from 1880 to 1897; Honorary Secretary from 1866 to 1870; and President, 1882–84. During his Presidency he presented the Gold Medal of the Society to Dr. B. A. Gould in 1883, and to Dr. A. A. Common in 1884, after delivering an appropriate address on each occasion. He was elected a Fellow of the Royal Society in 1868, and he served two years on the Council, 1881–83. He was an Honorary Fellow of Queens' College, Cambridge; M.A. (Cantab. et Oxon.); a Member of the Board of Visitors of the Royal Observatory, and of the Meteorological Council; an Honorary Doctor of Natural Philosophy in the University of Padua; a Corresponding Member of the Société

1898MNRAS..58R.143.

Nationale des Sciences Naturelles et Mathématiques at Cherbourg; and an Honorary Member of the Literary and Philosophical Society of Manchester.

From his youth Mr. Stone was very fond of fly-fishing and shooting. When resident at Greenwich and Oxford, he generally spent a portion of his holidays every year in these pursuits. He was accustomed to say that his fishing expeditions on the Irish and Scottish rivers were to him the most agreeable outdoor recreation, taking away all his thoughts from observatory work, and even from astronomy itself. Only a week before his death he was on a fly-fishing excursion in North Wales, and had had a slight accident by the upsetting of his boat. Hoping to avoid a chill, he rowed quickly back to the hotel, a distance of about two miles. In doing this he apparently overstrained his heart. About three days after his return to Oxford pneumonia set in, though he was able on the day preceding his death to spend some time in the Observatory, selecting a site for setting up some instruments for trial preliminary to his proposed journey to India to observe the total solar eclipse on 1898 January 22. On the same night he became much worse, but there was then no suspicion that he was in immediate danger. The end, however, came very suddenly, from cardiac failure, shortly before noon on Sunday, 1897 May 9, when he quietly passed away in the sixty-seventh year of his age.

By the almost sudden death of Mr. Stone, the Society has been deprived of one of the most devoted of its members. He was rarely absent from the Council table or at the ordinary meetings, where his well-known face will in future be sadly missed. It has been truly said that when joining in any discussion in which he felt a personal interest, "the brightness of his eyes, and the rapidity of his utterance, revealed the earnestness and energy of his spirit." Though he was ever ready to enter into an animated debate to defend his own conclusions, he was always genial, even when he differed strongly from others on some controversial point, while at the same time those who did not agree with his opinions usually respected the conviction with which he apparently held them. He has been known to spend hours writing and re-writing paragraphs stating his special views on astronomical questions, so as to avoid giving offence to anyone, though occasionally he felt that he must write plainly. The writer, looking back to his ten years of close official and private association with Mr. Stone at Greenwich, is able to recall to his mind many instances of this marked feature in the defence of his own opinions, and in his criticisms of another's work, as well as some most pleasing reminiscences of his assistance and kindness in many ways.

On 1866 September 12 Mr. Stone married a Devonshire lady, Grace, daughter of Mr. John Tuckett, by whom he leaves one son and three daughters.

E. D.

1898MNRAS..58R.143.

William Reynolds Vines was born in Bristol in 1817. He began life as a Moravian missionary, and served in Jamaica for some years, until he was invalided home. He eventually established a large and successful school at Elm Grove, Ealing, but was obliged to give it up in 1863 on account of ill-health. He had married in 1847, and had one son (now Sherardian Professor of Botany at Oxford). From 1863 onwards he travelled a great deal, but ultimately settled in 1889 at Auckland, New Zealand, where he died on 1897 November 16. He was elected a Fellow of the Society on 1855 April 13.

Charles Clement Walker was born in Clerkenwell in 1822, and was educated in London. He served his apprenticeship as a marine engineer, and later joined his brother, the late Mr. William Walker, in the construction of gas-work machinery, first in Clerkenwell and afterwards at Donnington. The business prospered greatly under the management of the brothers, and the works at Donnington now find employment for some 700 men. The firm have carried out some of the largest structures for the purification and storage of gas in this country and abroad. Mr. Walker was liberal in devoting his wealth to public and charitable objects—as, for instance, in the laying out of Wilmington Square and Northampton Square, in Clerkenwell.

Mr. Walker was one of the oldest readers at the British Museum, having obtained a reading-ticket at the age of 18, and scarcely ever missed an opportunity of visiting the Museum when he came to London. He had a telescope at his residence, Lilleshall Old Hall, and astronomy was his favourite study.

He died on 1897 February 4, from pneumonia and prostration following a severe attack of influenza.

He was elected a Fellow of the Society on 1879 March 14.

Wilhelm Döllen was born at Mitau, 1820 April 25. He there received his earliest instruction, chiefly from his father, who was principal of an excellent school; and at a very early age the exceptional ability of the boy, especially for mathematics, was made manifest. When he was 14 years old, his whole family removed to Dorpat, where he was introduced to the celebrated mathematician Bartels, who soon satisfied himself of Döllen's powers, and advised him, notwithstanding his youth, to attend the mathematical lectures at the University in the following year. From 1836 onwards Döllen also attended the astronomical lectures of W. Struve, with whom and whose family he, from this time, remained on the most intimate terms. According to the statutes Döllen could only be received as a student in the University in the summer of 1837, on attaining the age of 17, but he completed his course in the spring of 1839, and gained his degree with honours in mathematics. Immediately after this he was appointed assistant in the Dorpat Observatory, and remained for five years in that capacity, during which time he